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Optimization of Beneficiation Process for Upgrading Low Grade Egyptian Kaolin

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Abstract : Kaolin is naturally occurring ore predominantly containing kaolinite mineral in addition to some gangue minerals. Typical impurities present in kaolin ore are quartz, iron oxides, titanoferrous minerals, mica, feldspar, organic matter, etc. The main coloring impurity, particularly in the ultrafine size range, is titanoferrous minerals. Kaolin is used in many industrial applications such as sanitary ware, table ware, ceramic, paint, and paper industries, each of which should be of certain specifications. For most industrial applications, kaolin should be processed to obtain refined clay so as to match with standard specifications. For example, kaolin used in paper and paint industries need to be of high brightness and low yellowness. Egyptian kaolin is not subjected to any beneficiation process and the Egyptian companies apply selective mining followed by, in some localities, crushing and size reduction only. Such low quality kaolin can be used in refractory and pottery production but not in white ware and paper industries. This paper aims to study the amenability of beneficiation of an Egyptian kaolin ore of El-Teih locality, Sinai, to be suitable for different industrial applications. Attrition scrubbing and classification followed by magnetic separation are applied to remove the associated impurities. Attrition scrubbing and classification are used to separate the coarse silica and feldspars. Wet high intensity magnetic separation was applied to remove colored contaminants such as iron oxide and titanium oxide. Different variables affecting of magnetic separation process such as solid percent, magnetic field, matrix loading capacity, and retention time are studied. The results indicated that substantial decrease in iron oxide (from 1.69% to 0.61%) and TiO2 (from 3.1% to 0.83%) contents as well as improving iso-brightness (from 63.76% to 75.21% and whiteness (from 79.85% to 86.72%) of the product can be achieved.

Keywords : Kaolin, titanoferrous minerals, beneficiation, magnetic separation, attrition scrubbing, classification
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